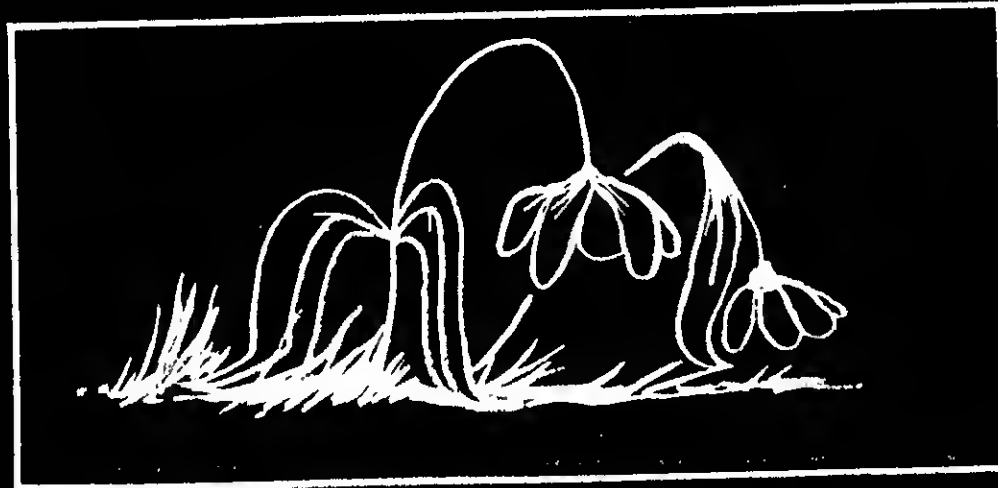


THE TOXIC MIST *the use and abuse of pesticides*



by Peter von Stackelberg

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A lot has been said. . . ■ in recent years

about the limitations on this country's economic and political independence.

But what price are we prepared to pay for our chemical sovereignty?

To put it bluntly, Canada has been free-loading when it comes to the data government uses to decide the acceptability and safety of chemicals and drugs used in industry, the home and on the farm.

We have also relied heavily on foreign countries, mainly the U.S., for disposal of toxic materials, notably polychlorinated biphenyls (PCBs).

The time may have come to stand back and examine the role chemicals are playing in our lives — and possibly our deaths. What are the costs of continued or expanded use of chemicals? What are the costs of curbing their applications?

The appropriate vehicle for examining such questions might be a federal royal commission.

The dangers of relying on foreign findings were underlined in the case of Industrial Biotest Laboratories, the private Illinois testing facility which faked results of close to 100 pesticides.

There is the case of TOK, the herbicide which was recently banned in Saskatchewan. TOK testing, which later proved inadequate, originally took place in the U.S. and Europe. It was this information, supplied by the product's producer, which Health and Welfare, and Agriculture Canada drew on in earlier approving TOK under the Pest Control



"We really don't like to bother you or interfere—but there's been a complaint!"

Products Act. (It was also new foreign evidence which led to TOK's withdrawal)

TOK also illustrates the divided responsibility not only between levels of government but also within the same jurisdiction on testing, licensing, regulating, labelling, marketing, transporting, using, and disposing of chemicals. This is true not only of pesticides but also of drugs, food additives and so-called industrial chemicals.

Health and Welfare Canada recommended last October that TOK, understood to cause birth defects, be withdrawn. However, Ottawa agreed to allow the manufacturer to keep marketing existing stocks.

Defining the lines of jurisdiction within and among governments is at times as difficult as tracing what happens to the chemicals themselves.

For instance, while it is Agriculture Canada which licenses pesticides, it does so after Health and Welfare has reviewed the manufacturer-supplied data on harmful effects of chemical residues in crops, as well as the health impact on those in contact with the pesticide.

Health and Welfare, which also has to approve new types and uses of drugs and food additives, admits practically all the testing on drugs it is asked to approve is done by foreign laboratories. Canada has limited facilities and the costs of in-country testing would be prohibitive in a "small" country like Canada, according to Health and Welfare Minister Monique Bégin.

Agriculture Canada does test out pesticides under Canadian conditions but also

has relied mainly on data generated elsewhere to decide the safety of approximately 430 pesticides on its approved list.

While there at least is a formal licensing process for farm-related chemicals and pharmaceuticals, there isn't for so-called industrial chemicals. The U.S. has established a list of about 30,000 such substances. That list is expanding by about 800 new products a year.

Environment Canada can act under the Environmental Contaminants Act to place materials on its prescribed list, but generally only does so after a product is introduced on the market.

Other federal departments come into the chemical equation on the transportation and labelling of chemicals and food additives.

Provincially, while the department of the environment has an over-all protective role, it was the Saskatchewan Agriculture-administered, provincial Pest Control Products Act which was applied in the TOK case. The federal and provincial departments of labor, through their occupational health and safety branches, are to ensure chemicals are properly used and stored at the work place.

We are not for a minute suggesting a royal commission is going to untangle all these crossed and overlapping lines of authority. However, royal commissions have been favored means to review issues of vital and lasting national concern. The roles man-made chemicals play in our lives surely fit into this category.

Such an inquiry need not be a witch-hunt to tick off thousands of chemicals as culprits.

Fraudulent or inaccurate test results for more than 100 pesticides, many used in Saskatchewan, have raised concerns about their long-term hazards.

A letter obtained by The Leader-Post says the results of long-term studies of the chemicals "are considered invalid" by the federal health and welfare department.

This means that a number of chemicals in use in Saskatchewan have not been proven safe.

The letter, written Jan. 25, 1980, by R. O. Read, chairman of a federal committee on pesticides, said the validity of all studies carried out by Industrial Biotest Laboratories (IBT) of Northbrook, Ill., "remains in doubt."

"All long-term rodent studies and multigenerational reproductive studies performed by IBT are considered invalid," Read said.

Other studies would have to be used to show the long-term safety of the chemicals.

In his letter, Read noted that government authorities were forced to send letters to a number of chemical companies, pointing out that many had "failed to submit the information requested by the Environmental Protection Agency and the Canadian health protection branch."

He also said spot checks by government officials had "uncovered serious problems which were not identified or reported" by chemical companies reviewing IBT test data.

"Most of the critical studies that have been audited are not satisfactory."

Read said the government's policy on the matter is that "the validity of all IBT studies remains in doubt until successfully demonstrated by the sponsoring company to be otherwise."

Questions about a wide variety of chemicals were raised about three years ago when an investigation in the United States revealed Industrial Biotest Laboratories had faked the results of some tests.

Not proven safe

Sloppy or inadequate records invalidated the results of other tests, according to the investigation by U. S. federal agencies including the justice department and the Environmental Protection Agency.

In some cases, sick test animals were apparently replaced with healthy ones.

The results of the IBT tests were used by regulatory agencies in several countries to establish safe uses for certain pesticides, food additives, packaging materials and drugs.

The Canadian government formed an interdepartmental committee — consisting of representatives from the environment, health and agriculture departments — to examine the matter more than two years ago.

But no list of the chemicals in question has ever been made public by the government.

Sources in the federal government have indicated 96 chemicals are under scrutiny, while a spokesman for the American Environmental Protection Agency said it has 123 chemicals on its list.

The Saskatchewan government has been attempting — unsuccessfully — for the past several months to find out from federal authorities exactly which chemicals are on the list.

Environment Minister Ted Bowerman said he has attempted to get information about the chemicals from the federal government, but has not received any replies.

"There is a major concern. We have a concern over what appears to be a weakness in the testing related to the IBT affair," Bowerman said.

Dr. David Penman, health consultant with the provincial environment department, said not knowing what chemicals might present long-term health hazards

leaves the province in a difficult position.

"There are concerns about a number of these chemicals. There is no doubt about that," Penman said.

"If Chemical X is on the list, and is for some reason suspect, it would be a real concern to governments in Canada to know the reason for the lack of validity of the informational base.

"If there are substantial doubts about the reasons why this Chemical X is used, then why is the licensing authority (the federal government) permitting its use?"

Penman said the identification of the chemicals is important.

"We want to be assured that if these agents are used in Saskatchewan, that they are safe for the workers who pack them, safe for the farmers who use them, that there is no hazard in their general use and storage, and that there is no hazard to the public when the chemicals are used and dispersed in the environment."

Bowerman said his department is dependent upon the federal government's findings.

"While at the present time there appears to be a question of whether there has been adequate and sufficient testing done on a number of chemicals, I'm not sure that we are in a position to be able to clearly state that the evidence is such that it would condemn them," Bowerman said.

"So one would have to wait on what the federal government says, and if it's found that (the chemicals) have not been adequately tested, then maybe the thing to do is go back and test them."

Bowerman said it is still too early to speculate about a ban on the use of the chemicals in question.

But he suggested that withdrawal of

federal approval until testing is redone might be appropriate.

"If we were to get the response (from the federal government), the opinion definitely expressed that there was inadequate laboratory testing, inadequate results or that the results were somehow jiggered or misrepresented, then one would have to seriously consider a temporary ban."

Sources within the federal government said information about the chemicals was to have been forwarded to provincial authorities earlier this year, but senior government officials stepped in and prevented that from happening. According to those sources, a letter outlining the situation was prepared and forwarded to federal Health and Welfare Minister Monique Bégin for her signature some time ago.

But the letter has not yet been received by officials of Saskatchewan's environment department.

The Leader-Post has obtained a partial list of the chemicals in question.

Among them are:

- Captan — a fungicide used in seed treatment and in garden and greenhouse crops;

- Carbonfuran — used as an insecticide, particularly on flea beetles and grasshoppers, being used in Saskatchewan this year to combat outbreaks of those insects;

- Diazanone — an insecticide that is widely used on gardens and can be obtained at most garden supply stores;

American studies have created concern about Captan's role in causing cancer. In a 1974 study Dr. Marvin Anderson of Henry Ford Hospital in Detroit and Dr. Herbert Rosenkranz of Columbia University said captan "is highly suspect to be a carcinogen."

The doubts raised about the validity of long-term studies of the chemicals tested by IBT do not mean there is necessarily a danger.

But it does mean that chemicals that were thought to be safe might not necessarily be so.

Pesticide controls — are they failing?

For years, we have assumed the pesticides we use in our homes, gardens and on farms are safe.

But are they?

Fraud and incompetence at laboratories testing multitudes of chemicals have raised major concerns about their safety.

The regulatory system for pesticides appears to be failing.

It has been condemned as having "major deficiencies" by the Saskatchewan environmental advisory council.

Farmers, grain elevator operators, and others suffer from health problems related to chemical exposure.

Yet chemicals whose safety is in doubt continue to be widely used.

Residues of these chemicals contaminate food and pollute lakes, rivers, wells and other sources of water.

A stinging condemnation of the regulatory system for pesticides is contained in the 1977-78 and 1978-79 annual reports of the Saskatchewan government's environmental advisory council.

"There are major deficiencies in the present research and regulatory process," the council said in 1978.

It said the federal government does not do enough independent research on the chemicals it approves.

"Both (the agriculture and health and welfare) departments are forced to rely in part on laboratory tests by the chemical manufacturers."

The advisory council said the lack of objectivity and credibility are sometimes missing when tests are sponsored by manufacturers.

The scandal involving Industrial Bio-test Laboratories of Northbrook, Illinois is just one example of this.

Questions about the safety of about 100

pesticides was raised in 1977 when an investigation in the United States revealed IBT had faked the results of some tests.

In some cases sick test animals were apparently replaced with healthy ones.

Sloppy or inadequate records invalidated the results of other tests, according to U.S. federal agencies investigating the fraud.

According to critics, this fraud, sloppiness or incompetence can be the result of pressure — subconscious or deliberate — on scientific staff with the company by research and development or marketing departments in a hurry to get the chemical onto the market and start making money.

Critics suggest independent laboratories, eager for lucrative contracts in the future, might also be influenced into producing information or interpretations of data that are thought to be in the interests of the company they are testing products for.

"A proliferation of many commonly used chemicals has occurred without sufficient prior examination of the potential consequences. These have instead become known in a costly and, in some cases, tragic manner," the advisory council said.

The council said comprehensive study of the thousands of commonly used chemicals for harmful effects has not kept pace with the rate at which they are introduced.

"The fact remains that most of the chemicals in common use have yet to be tested at all."

The advisory council was also critical of the lack of information about how many toxic chemicals are in use in Saskatchewan, the quantities of chemicals used, and where they are sprayed.

"On this basis alone existing provincial control mechanisms for the regula-

tion of toxic chemicals must be deemed inadequate."

While the IBT affair is the most glaring example of fraud and incompetence, there are others.

Samuel Epstein, professor of occupational safety and environmental medicine at the University of Illinois, said in the December, 1979 issue of *The Ecologist* there are a number of other cases of deliberate manipulation of tests or suppression of important information.

In an article entitled "Polluted Data" Epstein said fraudulent manipulation of data has been found for:

- The drug MER/29, resulting in the criminal conviction of several officials of Richardson-Merrill Company.

- The chemical Dornwall produced by the Wallace and Tiernan Company.

- McNeil Laboratories pleaded no contest on charges of concealing information about the chemical Flexin.

- Hazelton Laboratories was charged with falsifying data on the artificial sweetener aspartame and the drug Aldactone.

- The drug Panalba was withdrawn from the market in 1968 after information in the manufacturer's files was accidentally discovered by an American Food and Drug Administration inspector.

- The Velsicol Chemical Company was indicted by a U.S. grand jury in 1977 for suppressing information that Chlor-dane/Heptachlor was carcinogenic.

But the IBT affair has had the most serious effect.

The Canadian government has determined more than half of the 405 IBT studies examined up to March 28, 1980 were of no use in determining the safety of a variety of chemicals approved for use in Canada.

A further 410 IBT tests have yet to be

examined to find out if they are reliable.

Although the safety of 97 chemicals on the Canadian list could not be guaranteed, the federal government permitted their use during the past three years.

It will be at least another year before all the tests done by IBT will have been examined to find out if they were tampered with.

The federal government is now facing demands from the Saskatchewan environment department and from members of Parliament that it release information about why 233 tests done on a number of chemicals on the list of 97 were invalid.

Dr. David Penman, health consultant with the provincial environment department, said it makes a big difference if the tests were invalid because relatively minor data about the melting point of a chemical was improperly tested or if the very important tests establishing the cancer-causing properties of the chemical were wrong.

The provincial government will continue to push for release of all information regarding the IBT tests, environment minister Ted Bowerman said.

"If I do not receive more information promptly of if I am not satisfied that federal officials are taking appropriate measures to re-establish the status of the chemicals in question, I will be consulting with my colleagues in provincial health and agriculture to consider what measures Saskatchewan should take on its own," Bowerman said earlier this week.

But pressure on the federal government has not yet been sufficient to make officials release the information the province feels it needs to ensure the health and safety of both users of chemicals and the public.

The Canadian system for registration of chemicals could be thrown into turmoil by events in the United States.

Dr. Alex Morrison, federal deputy health minister, said the chemical industry might find significant changes forced on it if American investigations produce evidence of widespread fraud or incompetence in the testing of pesticides, drugs, food additives, and industrial chemicals.

Fraudulent and inadequate testing by Industrial Biotech Laboratories (IBT) of Northbrook, Ill., cast doubts upon the safety of the more than 125 compounds, including pesticides, food additives and drugs in commercial, agricultural and domestic use in Canada. Major problems with laboratory work carried out by IBT were discovered by American authorities in 1977.

"If IBT is an aberration we can deal with it," Morrison said.

"But a widespread inability to trust them (laboratories and chemical companies) could mean the government stepping in."

Morrison said his department officials have "heard rumors but have not yet been able to verify" reports of the U.S. Environmental Protection Agency investigating a number of firms because of inadequate or fraudulent testing of chemicals.

Earlier this week the Leader-Post revealed the EPA was investigating, in the words of an EPA official in Washington, "nine or 10 laboratories because of the possibility of careless or deliberately careless work."

Morrison said he would prefer to see the primary responsibility for testing of chemical products remain in the hands of the manufacturers. The government's role would be mainly that of auditing the data presented by the manufacturers.

He said the laboratory testing work

carried out by government would be of a limited nature, enough to give federal officials the competence necessary to thoroughly check industry data.

Morrison said it would be beyond the capability of the Canadian government to get involved in the actual testing of chemicals.

The financial burden — about \$1 million per chemical — would be excessive if the federal government had to test each of the hundreds of chemicals put on the market every year, he said.

The possibility of government, which

U.S. may upset registrations here

regulates the use of chemicals, getting into testing could also lead to conflicts of interest, Morrison said.

He said government scientists would also be subject to the same temptations that faced researchers with IBT.

"You don't want to trust government to do things totally, any more than you would trust industry," Morrison said.

He said the best testing and regulatory system would involve a mix of government, private industry and international agencies such as the Food and Agricultural Organization (FAO) and World Health Organization (WHO) of the United Nations.

That is essentially the system now in place, critics say.

Simon de Jong, MP for Regina East, said it is obvious that Canada needs its own testing facilities.

He said a number of private laboratories, like IBT, have shown they are simply not morally capable of performing the tests needed to ensure the long-term safety of chemicals.

De Jong was critical of statements made last month by federal Health Min-

ister Monique Begin that Canada is a small country that would have trouble testing all the pesticides in use here, and therefore should take advantage of information coming from other countries, particularly the U.S.

"The information we have been obtaining from other countries has all proven to be false."

"The argument for our own independent, trustworthy labs is so common sense that their rejecting it makes me suspicious."

Dr. David Penman, senior health con-

sultant with the provincial environment department, said the IBT affair shows there is a major defect in the Canadian regulatory system.

He said it is illogical that Canada, as a major industrialized nation and one of the largest producers of food, has no independent ability to carry out testing of pesticides used on food crops. "When people say we can't have this testing capacity I challenge that."

He said Canada already has the ability to carry out major studies of prescription drugs.

"Many of the major chemicals used in agriculture in Canada are implicated in this IBT affair."

"It is important that we have our own national capacity, under the direction of Canadians and serving the needs of Canadian agriculture."

The Saskatchewan government continues to push for more information on how the tests for the chemicals under suspicion were flawed.

Penman says it is essential for the province to know what data was faked

and improperly gathered so those exposed to the suspect chemicals can take effective measures to minimize the health hazards.

Morrison told The Leader-Post Friday that the IBT tests in question are mainly those into the long-term health hazards of the chemicals.

While the provincial government continues to make a fuss about getting more information from the federal government, officials in Ontario seem to be less concerned.

Dr. George Cooper, chairman of the Ontario government's pesticide advisory committee, downplayed the effect of the IBT scandal. "We have known all about this for the last three years," he said.

But the committee has not made any recommendations to the Ontario government about it, Cooper said.

"We don't really feel it is our job to advise the minister (of environment for Ontario) as to what to do about the IBT affair. We do recommend on many things, but not on this matter. We feel it is a federal matter, rather than a provincial one."

While provincial governments may have different views on their responsibilities, the costs of the IBT affair will touch everyone.

Those costs are colossal.

The Canadian government has already spent more than \$600,000, simply reviewing the information published by IBT, Morrison said.

But that pales beside the costs the chemical companies will have to pay for retesting the chemicals involved.

About \$100 million will have to go into this work, Morrison said. And the costs could be much greater.

Suddenly banning the use of the chemicals in question would create massive problems in agricultural production and the food processing industry.

If the scandal of fraudulent and improper testing spreads even further, and involves numerous other firms, the economic effects could be staggering.

Hazardous farm chemical still available across the country

A dangerous agricultural herbicide is being sold almost a year after federal health officials recommended banning it because there was no efficient way of stopping its sale sooner.

Wayne Ormrod, associate director of the pesticides section of the federal agriculture department, said Friday the voluntary withdrawal of the herbicide TOK by its manufacturer was the most effective way of dealing with the matter.

"If more formal regulatory action was taken against the registration, and there was an appeal, it could have taken much longer to remove it from the market. In many cases like this a voluntary withdrawal by the company is the most efficient," Ormrod said.

The chemical TOK — sold under the trade names TOK E-25 and TOK/RM Selective Herbicide — is known to cause birth defects. The herbicide is used on rapeseed crops on the Prairies and on some commercial vegetable crops, primarily onions, in other parts of the country.

U.S. plans ban

The American Environmental Protection Agency (EPA) is planning to impose a ban on the manufacture and sale of the chemical in the United States within the next two weeks, an official in Washington told The Leader-Post Friday. He asked that his name not be used.

Evidence of the potency of TOK in causing birth defects led California to put severe restrictions on its use, the official said.

"One dose of it can cause birth defects," he said.

"Pregnant women are forbidden to work in fields (in California) where TOK has been sprayed. As well, there is

a 14-day waiting period before any workers are allowed in treated fields."

Even then the workers are required to wear rubber gloves, boots and clothing and respirators, he said.

Carol Peacock, an information officer with the health department in Ottawa, said the manufacturer had voluntarily pulled the chemical from the market almost a year ago, after the department recommended it be withdrawn.

TOK to be banned

A ban on the sale and use of the herbicide TOK was announced Friday by the Saskatchewan government.

"TOK is a serious health hazard and continued use of the herbicide can not be recommended under any circumstances," Environment Minister Ted Bowerman said.

"The Saskatchewan government warns the public, and particularly farmers, that the herbicide is a serious danger. We are moving to place a prohibition on its use and sale," Bowerman said.

The Leader-Post revealed last week that scientific data presented to the federal government last October showed the chemical to be highly dangerous. Extremely low doses given to mice in laboratory tests caused deformation of the diaphragm muscle — essential to breathing — to such an extent many of the animals died shortly after birth from suffocation. Another problem dis-

covered in test animals was that glands similar to the human tear glands failed to develop.

The chemical is absorbed through the skin as well as entering the body through the digestive and respiratory systems.

Bowerman said Saskatchewan residents who have unopened cans of the chemical — sold under the trade names TOK E-25 and TOK RM Selective Herbicide — should return them to the dealer.

"Dealers are in turn advised to return the chemical to the manufacturer," Bowerman said.

The herbicide should not be dumped on land or in water, he warned.

"Partially used cans should be securely sealed and enclosed in double plastic bagging. Local agricultural representatives will be able to advise farmers about disposal of the partially used cans of TOK," Bowerman said.

to be sold.

The herbicide was first registered for use on vegetable crops in 1967 and on rapeseed crops in 1970.

At the time scientific information collected by the company indicated the chemical was acceptable for use, Elliott said.

"But more recent studies indicated it was absorbed more rapidly through the skin than originally thought. That reduced the safety factor of the chemical."

Ms. Peacock said the health department's recommendation that TOK be banned was based on information Rohm and Haas submitted last fall.

"The new information indicated it caused birth defects. The second study (which uncovered the birth defects) was done by a different method than the initial one," she said.

Causes cancer

She said studies done by the American National Cancer Institute also indicated the chemical caused cancer. But the federal health department did not go into studying in depth the question of cancer because there was sufficient evidence of birth defects to call for removing the chemical from use.

While the health department can call for the withdrawal of hazardous chemicals from the market, only the federal agriculture department has the authority to pull it.

Peacock said her department went as far as it could and the decision to allow Rohm and Haas to sell off its remaining stocks was made by the agriculture department.

Widely used insecticide

under attack by

the American

EPA

An insecticide used widely in seed treatments and household products available in Saskatchewan is under attack by the American Environmental Protection Agency (EPA).

The chemical Lindane is also used in a more than 80 different products. Among those registered in the federal government's 1979 listing of pest control products are pet flea and tick collars and sprays, livestock insecticide treatments, and louse and flea preparations for human use.

Use of the insecticide will probably be severely restricted in the United States within the next year, Jim Sibbison, an EPA spokesman in Washington, said.

An EPA document, dated June of this year, obtained by The Leader-Post recommends banning Lindane for almost all uses, including seed treatments, household uses, and for treatment of logs and lumber. The few uses that should be continued would be under severe restrictions. Only licenced applicators would be allowed to work with the chemical, and then only when completely dressed in protective clothing, neoprene aprons, boots, and elbow-length gloves. Special warnings recommending pregnant women avoid exposure to the chemical were also suggested by the EPA.

Lindane is known to cause cancer and other tumors, birth defects, and reproductive disorders in test animals. There have been numerous reports of the chemical causing anemia and several scientific reports have noted Lindane might cause leukemia. The EPA also expressed concern about the toxic ef-

fects of Lindane on young children.

'A number of cases of Lindane poisoning in children heightens the agency's concern about the sensitivity of children to the effects of Lindane.'

The Saskatchewan environment department just recently started its own examination of the chemical.

Major significance

The department is attempting to get access to the federal agriculture department documents containing scientific information on the health and biological effects of the chemical, Dr. David Penman, senior health consultant for the environment department, said.

The chemical has major significance for agriculture in Saskatchewan. Lindane is in all the dual-purpose seed treatments listed in the provincial agriculture department's most recent pamphlet on available seed treatment products.

But there are a number of problems with the chemical.

The Saskatchewan government is currently trying to figure out how to get rid of about 500,000 pounds of rapeseed treated with Vitavax - a Uniroyal product that contains Lindane. The germination of the rapeseed was substantially reduced by the seed treatment and seedlings that did emerge were weakened and

unable to survive adverse weather conditions.

The chemical was also involved in the death of a Manitoba farmer earlier this year. The death was because of kidney failure caused by exposure to Vitavax, the medical examiner involved in the case said.

Most Saskatchewan residents, whether they use Lindane or not, are ex-

Lindane widespread

posed to it. The 1978-79 annual report of the Saskatchewan Environmental Advisory Council said Lindane was widespread in rivers, lakes and other surface water in the province. The highest concentrations of Lindane in surface water was found in the Qu'Appelle River district, the advisory council said.

It said most agricultural chemicals tend to accumulate in sediment on the bottom of lakes and streams.

'Bottom sediments therefore serve as a sink for these toxic substances and, through the process of biological (accumulation), pose not just an immediate but also a long-term potential threat to the environment,' the council said.

Vitavax is among more than 100

chemicals involved in fraudulent and inadequate safety tests carried out by Industrial Biotech Laboratories (IBT) in the United States.

The chemical remains on the market in spite of assurances by federal Health Minister Monique Begin that doubts about safety would prompt quick government action.

'My officials have been instructed to examine laboratory data with particu-

Action promised

lar reference to detecting any previously reported adverse effects,' Begin said July 31 of this year.

'Should any such effects be noted, suggesting a potential health hazard to the Canadian public, appropriate action, including a recommendation to deregister (the chemical), will be immediately initiated.'

Just two weeks before that, Begin had given assurances there was no evidence of that potential health hazards existed with any of the IBT chemicals.

Laws covering chemical labelling said poor

Industrial chemicals can be killers. Some victims die quickly. Others go slowly with one of a variety of agonizing diseases. Some victims live, but spend life as cripples.

Yet Canadian labor laws provide little protection for workers exposed to the thousands of chemicals used in the workplace, Bob Sass, director of occupational health and safety with the Saskatchewan labor department, said.

Yet because of poor laws covering the labelling of chemicals, most workers do not have the information they need to protect themselves. He said many chemicals in use in industry are known to be dangerous, but the use of trade names for products containing these chemicals often hides their true nature from workers, employers and government officials.

"There are enormous deficiencies in labelling of chemicals in Canada," Sass said.

"Many of the chemicals that go into the workplace can not be innocuous. They have been brought in to do something — they are reactive, they are agents that make changes and do things. That's why they are used.

"I'm not saying they are all equally harmful. But if you look at the history of occupational health, more and more is becoming known about their toxicity and their long-term hazards."

The most dramatic recent examples of chemicals killing or injuring workers are Kepone, which attacks the central nervous system of workers exposed to it, and Vinyl Chloride, a powerful cancer-causing chemical. The effects of Kepone were such that its use has been banned in Canada and the United States. After the hazards of Vinyl Chloride were discovered, the permitted levels of the chemical in air in plants using it were severely cut.

More chemicals now in use will be found to be dangerous, Sass predicted.

Moves towards tougher labelling requirements are being made in the United States. The Canadian government should at least keep pace, if not lead the way, or it could become a dumping ground for the hazardous chemicals not permitted in the U.S., he said.

The giant multinationals are not above shipping problems to areas with less stringent regulations. A number of companies have moved asbestos production facilities to countries where regulations are more relaxed than in North America, exporting occupational disease at the same time, Sass said.

"I don't think this is so crazy. There are many of these measures in consumer protection. It seems to me we ought to go at least that far to protect workers, and then a bit further, because we know what kind of stuff they are handling."

He said Saskatchewan is moving towards the introduction of laws requiring all employers to list the chemicals they use, the known health hazards of those chemicals, and a description of what is not known about the health hazards. All that information will have to be made readily available to workers.

But provincial action on labelling of containers of chemicals is nearly impossible, Sass said.

Jim McLellan, director of occupational health and safety with the federal labor department, said the Canada dangerous substances regulations do provide the type of protection for workers that Sass is advocating.

But those regulations only apply to workers in occupations under the jurisdiction of the federal government — about eight per cent of the Canadian workforce. McLellan said the federal government, in cooperation with the provinces, is moving towards legislation

that will better protect the remaining 92 per cent of the work force. He did not have any idea of when that protection would be in effect, however.

Sass notes labelling of pesticides is now much more stringent than for industrial chemicals.

But there are still serious inadequacies in that area as well. Dr. David Penman, senior health consultant with the Saskatchewan environment department, said.

He said warnings that people should not breathe or have skin contact with pesticides are not sufficient.

"The labels should fully advise people of the potential health effects of exposure to these chemicals."

Many of the pesticides in use can be absorbed through the skin, yet labels usually give no indication of that.

Major differences in labelling of identical pesticides exist between Canada and the U.S. The herbicide TOK, banned by Saskatchewan because it causes cancer, birth defects, and other health problems, is one example.

On the drums available in Canada the warning reads: "Don't breathe spray mist. Avoid swallowing and contact with skin and eyes." There is no special warning to women, and no indication of possible health hazards.

The label on drums of the chemical sold in the U.S. reads: "Restricted use pesticide. For retail sale to and use only by certified applicators or persons under their direct supervision.

"WARNING TO FEMALE WORKERS. Women of childbearing age should not be involved with mixing/ loading or application of this product. Exposure to this product during pregnancy must be avoided. Exposure to TOK has caused severe, delayed adverse effects in experimental animals.

"Severely irritating to the skin and

eyes. Readily absorbed through the skin. Harmful if swallowed, inhaled, or deposited on skin."

The warning goes on to say special protective clothing must be worn when using the chemical and anyone unwilling or unable to follow all the warnings on the label must not handle the chemical.

All labels on pesticides used in Canada must be approved by the federal agriculture department.

But comments made by an official of that department at the annual meeting of the Canadian Association of Pest Control Officers, an organization of federal and provincial officials, last November raise serious questions about the attitude of the federal government.

In a document obtained by The Leader-Post, Wayne Ormrod, chief of the federal agriculture department's pesticide section, said product labelling "should not get too detailed in light of the need to treat large and small areas" of forested land.

He went on to say too much detail on labels could lead to increased violations of the law or to more charges from environmental groups. Labelling will be handled in such a manner as to avoid such problems, he said.

At the same meeting it was noted labelling problems with drums of the pesticide picloram (trade named Tordon 22K) resulted in the chemical being sprayed from aircraft near Penticton, B.C. Drift of the chemical caused damage to between 80 and 100 properties.

B.C. officials at the meeting said the chemical might be safe for aerial application in wide open areas, but it was not safe for application in that manner near settled areas. Yet the labels on the chemical containers gave no indication the chemical should not be applied using aircraft.

Pause a moment before you sink your teeth into that crisp, red apple — or into that tender barbecued steak, or any of the food you eat. Ponder the fact that within that food are traces of a multitude of pesticides.

That nice fresh California tomato could have as many as 73 different pesticides in it. Think about the incident last fall when geese feeding on cauliflower leaves at a roadside vegetable stand in B.C. died because of insecticide poisoning. The residues in those leaves were five times the permitted level.

While incidents of human poisonings from pesticide residues are rare, every person does get a small dose of pesticides from food — an average of 35 milligrams annually.

But eccentric eating habits could expose Canadians to pesticide residues above levels the federal government figures is safe. Canadian eating habits are used in calculating pesticide residue levels (tolerances) in food. The most common foods have lower tolerances. But eating only one type of food, as some fad diets recommend, can throw the calculations off.

"Clearly the methods by which tolerances are set and by which the total diet is determined merits serious reconsideration," Linda Pim, researcher for Pollution Probe in Toronto, said.

Ian Monroe, acting director general of the federal health department's food directorate, said nutrition surveys, and to a lesser extent, surveys of households have been used to determine eating habits. The statistics gathered are used to determine consumption of various types of food. They also look at the higher levels of consumption of certain foods by individuals and take into account differences in eating habits among various ethnic groups.

Other factors in setting the residue levels are the tendencies of different

Those juicy foods may be juicier than you think

foods in retaining varying levels of residues, and on the basis of the effectiveness of the pesticide under differing crop and application conditions.

The resulting figures are used to set tolerances in different types of food.

For example, the insecticide Carbaryl is allowed in concentrations of .2 parts per million in potatoes. But apricots, asparagus, spinach, watercress and numerous other foods, which are not eaten as often by most Canadians, can legally contain 50 times that concentration. Dairy products and poultry meats are allowed to contain Toxaphene in concentrations of .1 part per million, while beans, black-eyed peas, broccoli, citrus fruits, celery and many other vegetables can have concentrations 70 times that of the lower limits.

In the United States, where pesticide residue levels are established in much the same manner, the Environmental Protection Agency (EPA) and California's agriculture department are under attack because the statistical averages they used grossly underestimated the consumers' pesticide exposures.

For example, the EPA's list of 81 foods which are "seldom consumed" means less than 7.5 ounces are eaten by an individual each year. Among the items on that list are avocados, blueberries, Brussel sprouts, eggplant, mushrooms, plums and walnuts.

Pim says in her upcoming book *The Invisible Additives* that the American averaging system assumes everyone in the U.S. eats fresh pears.

"In fact, perhaps five per cent of the population actually does. Each consumer of fresh pears consumes about 2,000 per cent more pear than the EPA estimates," Pim says.

The "market basket surveys" used in the U.S. for determining pesticide intake have come under attack by the General Accounting Office (GAO), a branch of the U.S. congress.

Similar kinds of food were lumped together, obscuring the kinds and amounts of residues specific foods contain. For example, a researcher at Texas A & M University found a person would have to eat two pounds of raisins a day to exceed the acceptable daily intake of the fungicide captan.

But two medium-sized apples a day would easily provide a person with more than the acceptable level of the chemical.

The safety of pesticide residues in food is also coming under closer scrutiny. Pesticide residues at levels that would be immediately toxic to humans are rare.

But the long-term safety of the numerous chemicals sprayed on food products as they are grown, stored, processed

and sold is being questioned.

"In the past we willingly accepted claims that pesticides have no long-term effect on humans," Douglas Costle, administrator of the EPA in Washington, said.

"But neither the EPA nor industry is in a position to make such reassurances honestly."

Evidence of subtle and long-term health problems relating to pesticides is mounting. Among the findings are:

- A researcher at the Harvard Medical School showed that minute amounts of pesticides can alter brain activity, causing irritability, insomnia, and reduced ability to concentrate;

- Allergies to pesticides can be responsible for flu-like symptoms and general ill health. Some people suffer more violent allergic reactions to pesticides, forcing them to take extreme care in avoiding contaminated food, and

- The combination of pesticide residues with drugs and other chemicals can cause unpredicted toxic reactions. For example, some insecticides are more toxic than expected in animals given the drug Phenobarbital. Another type of insecticide can combine with nitrites, a food preservative, to form cancer-causing nitrosamines.

While many of the pesticides that contaminate food are deliberately sprayed on them, some enter accidentally.

The fungicide Pentachlorophenol, used to protect timber and wood products, is one that is causing problems in the poultry industry. Wood shavings used as litter in chicken coops and major production facilities are usually contaminated with the chemical.

The birds absorb the fungicide, causing the meat to take on a bad taste. As well, poultry flocks are more prone to certain diseases in spite of vaccination against them. The chemicals in the contaminated shavings are suspected of suppressing the birds' immunological system.

While the law seems quite clear, Canadians regularly eat food that contains small amounts of poisonous chemicals.

Among the pesticide residues still allowed in food sold in Canada are DDT, Toxaphene, Chlordane, Heptachlor, Aldrin, and Dieldrin — all banned because of their toxic effects. Numerous pesticides known or suspected of causing cancer, birth defects, genetic damage, nerve damage and other health problems are permitted at certain levels in food.

The Canadian government has interpreted the Food and Drugs Act to mean that pesticide residues shall not exceed certain levels. The assumption is the pesticide residue levels (tolerances) established by the federal health department are safe and consumers will not suffer any long-term health hazards by eating small amounts of these dangerous chemicals.

While environmentalists in this country have not yet used the Food and Drugs Act to push for pesticide-free foods, a similar law in the United States is the basis of a major law suit in California.

Health, environment and labor organizations, three farmworkers and two state politicians last February filed a suit against the California food and agriculture department, claiming the department had failed to keep food in the state free of pesticides that cause cancer, birth defects, sterility and mutations. The suit demanded the state eliminate 37 of the most harmful pesticides from food supplies and tighten its regulations on 244 other pesticides.

Ralph Lightstone, a lawyer for the group, said in a recent interview with The Leader-Post the law suit does not seek a ban on the use of the pesticides, but simply wants them kept out of food.

He said California's agriculture de-

Examining the data on pesticides difficult

No person shall sell an article of food that has in or upon it any poisonous or harmful substance.

-Section 4 of the Canadian Food and Drugs Act

partment is required by law to determine that the pesticides in food are safe to eat.

"But in violation of the law, the department has effectively shifted the burden of proof so the pesticide is allowed in food until it is proven to be dangerous.

"The difference is crucial, since scientists may not know for years or may never know whether a pesticide which causes cancer, birth defects, mutations and reproductive disorders in laboratory tests does not cause those same effects in humans."

The attitude of California's agriculture department is not unique. Canadian officials have adopted the policy that chemicals now on the market must be proven hazardous before being removed.

That policy is best illustrated by the scandal involving 100 chemicals tested by Industrial Biotech Laboratories (IBT) in the U.S. Various tests of the long-term safety of the pesticides are missing or were fraudulently or improperly done. But residues of those chemicals are allowed in food in spite of the fact scientific information about their potency in causing cancer, birth defects, genetic damage and other health hazards is missing.

The Canadian government first established pesticide residue tolerances in 1956. Changes in testing procedures and

equipment have lead to changes in tolerances. As well, newer tests for cancer, birth defects and other health effects have been made mandatory in recent years.

But the government's regulators have not kept pace with the technical advances.

"In the last few years the amount of data available on pesticides has increased at a tremendous rate. Because of this the pesticides section is experiencing difficulty in handling the data and thus in staying current with new developments in the field," a federal agriculture department memo dated Feb. 14, 1980 said.

This country is still without its own set of guidelines for information about the safety of pesticides approved for use here.

"Canada does not yet have a full set of guidelines for submission of data in support of registration of pesticides," Janet Taylor, of the federal agriculture department's pesticides section, said.

"The EPA in the U.S. has published a very comprehensive set of guidelines. We are using its guidelines as the basic document and are now adapting it to our specific needs."

Among the studies required by the American guidelines are those for reproductive disorders, genetic damage, cancer and other tumors, birth defects and damage to the nervous system.

But enforcement of those guidelines has been criticized in U.S. congressional hearings into cancer-causing chemicals. About 30 of the 268 pesticides used in food production are suspected of causing cancer. As well, 92 chemicals in use were missing safety studies of one type or another, investigators for the General Accounting Office (similar to the Canadian auditor general's office) said. These 92 chemicals are in addition to the 100 IBT chemicals for which safety studies were faked or improperly done. In spite of the missing scientific data, American and Canadian officials have set pesticide tolerances that are supposedly safe for humans.

Examining data in federal files on the health effects of pesticides is difficult. While that information is supposedly available to anyone wanting it, the federal authorities have thrown a number of roadblocks in the way. Information considered a trade secret, including figures on sales volume of a specific chemical, are withheld from both provincial government officials and members of the public. Those people wanting information about the health effects of pesticides must apply in writing. They have no automatic right to see the information and can be denied access to it.

Even if they do get permission to see it, the federal government throws down another roadblock. It requires that the person go to Ottawa to see the data. They can take notes but are not allowed to photocopy the material.

Saskatchewan environmental department officials ran into those roadblocks several times in the last few months. Information on the IBT scandal was only released by the federal government after three months of repeated requests from the province. Information about the hazards of the herbicide TOK, recently banned in Saskatchewan because the chemical caused severe birth defects, had to come primarily from the United States.

Studies show protective clothing won't prevent contamination

Most pesticide manufacturers warn against skin contact and recommend protective clothing be worn so threats to health are avoided.

But protective clothing does not prevent contamination of the skin when spraying is done, two recent federal studies found.

Dr. Raj Grover, a scientist with the agriculture research station in Regina, this summer conducted a study of pilots, chemical mixers, water carriers and flagmen involved in aerial spraying of the herbicide 2,4-D. He said preliminary analysis of the data collected showed all the people involved in the spraying operations received some exposures to the chemical even though they were wearing coveralls.

The mixers, who were handling the chemical in its concentrated form, received the largest doses.

Grover said the vapors from the chemical can penetrate the clothing and settle on the skin. From there the chemical can be absorbed into the body.

Although the protective clothing did not stop the contamination, it reduced the exposures to 10 per cent of the levels recorded on the outside of the clothes.

But the penetration might vary, depending on a variety of factors, including the type of pesticide used, how easily it vaporized, and the type of material the clothes were made of.

A study carried out in B.C. orchards in 1979 found the insecticide Guthion used there also penetrated the protective clothing.

The chemical was found on the chest, shoulders and arms of the spray applicators, even though they had worn overalls when they sprayed, as well as on the

uncovered parts of the face and neck.

The study also found there was no significant reduction in exposure levels when rubberized protective coats and pants were worn. It did note the rubberized clothing might protect against con-

tamination if there was a spill of the chemical.

But when spraying, between one-quarter and one-half of the pesticide that landed on the protective clothing reached the skin, the study concluded.

Many said unaware of pesticide potency

The family doctor and the public are not usually aware of the tremendous potency of many of the pesticides now in use in this country, a symposium on family medicine was told in Regina Saturday.

Dr. Stanley Greenhill, chairman of the community health department at the University of Alberta, said many of the pesticides now used in agriculture and in the home are byproducts of chemical warfare weapons. He said the insecticides in the organophosphate group, which include Parathion, Malathion, and Diazinon, are variations of the military nerve gases.

"I would like to see every bottle labeled as such," Greenhill said.

He said in addition to being a health hazard when swallowed or inhaled, many of the chemicals can also be absorbed through the skin and can be a threat even when touched.

The family physician faced with pesticide poisoning in a patient might not even recognize it as such, Greenhill said.

He told of one couple in Alberta who had seen 17 different doctors, only to be told they had a wide variety of physical or psychological problems. Among the symptoms were flushed skin, weakness and headaches. After extensive testing, it was found the chemical Dimethoate (also known as Cygon) sprayed on an apple tree to control insects was the cause of the illness, Greenhill said.

Another chemical that is even more deadly, but which is readily available, is Paraquat, he said.

"If Paraquat is ingested or inhaled, death is the result. There is no known antidote," Greenhill said.

He emphasized the importance of following label directions, the wearing of protective clothing and proper storage and disposal of chemical containers as some of the measures necessary in ensuring poisonings do not happen.

Greenhill said one area in which scientific information is missing is the interaction between the organophosphate insecticides and prescription drugs a person might be using.

"You can't totally eliminate exposures when spraying pesticides. There will always be some," Grover said.

He said the study on people involved in aerial spraying showed skin exposures were far more significant than the amounts of chemical breathed in.

"The spray cloud has relatively low concentrations of the chemical. With the skin having such a large surface area, it is the most significant route of exposure."

The findings that protective clothing does not eliminate skin contamination make it vital that scientific tests on the skin absorption rates of the pesticides on the market are done, Dr. David Penman, senior health consultant with the Saskatchewan environment department, said.

Many of the pesticides in use now are absorbed through the skin and can cause illness or death, as well as long-term problems like cancer, birth defects or genetic damage.

The herbicide TOK, recently banned by the Saskatchewan government, was found to be highly dangerous when absorbed through the skin. Scientific studies showed the chemical was more potent in causing birth defects when absorbed through the skin than when swallowed.

The question of skin contamination is also important in light of the fact that skin absorption data on 2,4-D was found to have been flawed when the Industrial Biotech Laboratories (IBT) scandal was uncovered in the United States. Scientific data for more than 100 pesticides now in use was faked or improperly done by IBT.

Fungicide not taken off market despite invalid tests

The federal government permitted the sale and use of the fungicide Captan for the past two years, although it knew that tests on whether the chemical caused cancer, birth defects and mutations were useless, The Leader-Post has learned.

Dr. Alex Morrison, head of the health protection branch of the federal health and welfare department, said Monday 13 of 14 tests on Captan's health hazards done by Industrial Biotest Laboratories (IBT) in the U.S. were invalid.

Evidence of fraud and improper testing at IBT was uncovered in the summer of 1977. An American grand jury is still investigating the matter.

Morrison said his department knew two years ago the tests for cancer were invalid and there was no other information to replace them.

He added that the department has also been aware for some time the tests for birth defects and mutations were no good.

He declined to say why Captan was not removed from the market. Previously, however, federal officials have cited a lack of evidence of substantial health hazards and possible adverse effects on agriculture for not banning chemicals tested by IBT.

He said the federal government should have a set of replacement studies about the chemical's cancer-causing properties in about six weeks.

But he said there is not yet any indication of when replacement studies for birth defects and mutations will be ready.

Morrison added the federal government is concentrating its checking of IBT-tested chemicals in the area of long-term studies.

"Our major concerns are with the

long-term studies. Those are the ones that are likely to show the major health effects."

There is virtually no information about the safety of numerous chemicals now used in Canada because of faulty testing by IBT, a firm located in Northbrook, Ill., a suburb of Chicago.

Although the Canadian and U.S. governments have not yet banned the sale and use of any chemicals involved in the IBT scandal, the Swedish government has.

Two years ago, Sweden prohibited the sale of the chemicals Captan, Captafol (Difolatan), Alachlor (Lasso), Terbutryn (Ingran, Topoguard or Prebane), Terbutylazine (Topoguard or Faneron), and Metabromuron (Patoran). This ban was as a direct result of the IBT scandal.

Dr. Diana Reisa, an official with the U.S. Environmental Protection Agency (EPA) in Washington, said Monday nearly 250 of 600 studies done by IBT — and later reviewed by U.S. and Canadian government authorities — were found to be invalid.

But the biggest problem area is with long-term studies — studies designed to

turn up cancer and other tumors, reproductive disorders, problems in the second and third generations of the laboratory animals that were exposed, she said.

Reisa said 99 per cent of those long-term studies were invalid. Other problem areas were:

- Tests for birth defects — 76 per cent invalid;
- Tests for mutations — 50 per cent invalid;
- Tests on toxic effects of the nervous system — 50 per cent invalid;
- Tests to determine how toxic the chemical is if swallowed, breathed or absorbed through the skin — 30 per cent invalid, and
- Medium-term tests for a variety of effects — 50 per cent invalid.

While about 600 tests have now been examined by government investigators in the U.S. and Canada, more chemicals have been added to the list of substances tested by IBT.

In a Oct. 22 letter to the Canadian Environmental Law Association, Mary Miller, EPA official, said more than 1,600 studies for 202 chemicals, all tested by IBT, are being reviewed.

A list of chemicals involved in the IBT affair released in July by Canadian federal Health Minister Monique Bégin had 106 chemicals.

Morrison said it will be several weeks before the federal government has a list of the chemicals and which specific tests are invalid.

But a list of about 120 chemicals tested by IBT was obtained by The Leader-Post from the EPA.

That list shows IBT did a major series of studies on a number of chemicals, in addition to Captan, that are important to agriculture in Saskatchewan.

Among them are:

- Barban (trade named Carbyne) — tests done include two-year feeding studies to determine effects of long-term exposure and acute toxicity tests;
- Carbofuran (trade named Furadan) — tests done include those for acute toxicity, toxicity on nervous system, cancer, birth defects, reproductive disorders, mutations, and birth defects;
- Endosulfan (trade named Thiodan) — tests done include those for reproductive disorders, birth defects, mutations, and toxicity from long-term exposures;
- Glyphosate — tests done include those for cancer, reproductive disorders, birth defects, mutations, residues in food, and poisonous effects if swallowed, breathed and absorbed through the skin, and
- Triallate (Avadex BW) — tests done include those for birth defects, mutations, effects from long-term exposures through food and water, and toxic effects on the nervous system.

But the EPA would not say exactly which tests might be invalid for each chemical. Reisa said only the companies manufacturing the products would be notified of problems with specific chemicals.

Chemicals in food said failing society, making people sick

Chemicals are not creating the rich, happy and healthy society they are supposed to, a conference on alternatives to chemicals used in food production was told Friday.

"Instead, they are in many cases creating more problems than they are solving and, worst of all, they are beginning to make people sick," said Bruce Small, president of the Human Ecology Foundation.

Small, a professional engineer from Toronto, his wife and their daughter all suffer from severe allergies to many of the chemicals now in the environment. He said numerous cases of crippling and potentially fatal allergies to numerous substances are starting to emerge.

He said in many cases the allergy victims have multiple allergies. They react to almost anything they come in contact with in food, air or water. They react to many natural substances such as dust, pollen and molds as well as a variety of man-made chemicals.

Small said physicians who treat these multiple allergies — which he calls ecological illness — believe the disease is caused by a stress overload on the body.

"Each of our bodies was de-

signed to handle only so much stress. Some, myself included, went over that stress limit. Once we were overloaded, our bodies seemed to lose all ability to adapt to stress whether it is physical or psychological. Foods that were nourishment before turned to allergic foods. Old allergies worsened. And new allergies emerged."

Small said there is no single cause of this ecological illness, but rather it is the result of numerous exposures to a number of substances during persons' lives.

"For some people doctors can trace a slow buildup of symptoms, related to a slow buildup of chemical and other stressing in their lives. Some become ill suddenly, as documented by Dr. William Rea in Dallas. He has found many cases of people who have been seemingly well all their lives, with not a trace of an allergic history. They encounter some significant chemical exposure and all of a sudden they are sensitive to everyday chemicals. Sudden overexposure to chemicals seems to bring on a breakdown in the bodies' adaptive abilities for some of us."

Small said concentrations of pesticide residues in food or minute quantities of food additives that are safe to most people can send a sensitive person into convulsions.

He said the relatively small number of people who are now showing signs of severe multiple allergies could be a preview of health problems in the future.

"There are a growing number of people who have already succumbed to society's way of life. They are sick now and need help now."

Many of the signs of multiple allergies can be mistaken for other health problems or as signs of some sort of mental disorder, and many doctors are unable or unwilling to help patients with these allergies, Small said.

He said people who are starting the slow buildup toward chemical sensitivity can "turn around their health with comparative ease" if they find clean food, clean air, and clean water.

"Yet it is surprisingly hard to find those," Small said.

He said there are many sources of problems and agricultural chemicals are only one of many.

"Unfortunately agriculture is still a prime target. That is because agriculture has the dubious distinction of employing some of the most powerful chemicals known to man. Our present battery of pesticides is slowing gaining the reputation among the medical people treating these new 20th century illnesses as the most potent sensitizers around."

He said a single exposure to a freshly sprayed area in a park is enough to trigger a response in a few people that will turn them from "a seemingly normal human into a super-allergic."

"These powerful chemicals seem to trigger the baffling process of a spreading chemical sensitivity. Often people begin with a relatively clear-cut sensitivity to one chemical. Over time continued exposure to the sensitizing chemical breaks down the body's ability to adapt, until the stress causes the individual to become sensitive, one at a time, to many of the major chemicals in the environment."

Small noted that farm families are particularly at risk

because of the many kinds of agricultural chemicals they are exposed to.

There are alternatives to the use of large numbers of chemicals in producing food, a number of farmers told the conference.

John Sarvas of Biggar said he has been producing livestock without using pesticides, antibiotics and vaccines for many years.

"The best protection against disease in livestock is feeding nutritious feed and keeping the livestock and the areas they occupy clean."

Sarvas said that healthy livestock have the immunity they need to cope with many of the health problems producers face.

Doreen Reitenbach said they have been producing poultry, beef and grain for the last four years without having to resort to chemicals.

She said there has not been any economic disadvantages because people are willing to pay a fair price "for a tasty and clean product."

Pesticides prove no panacea

The massive chemical assault on the pests that plague North American food production is not the cure-all once anticipated.

At one time chemical pesticides were thought to be the solution to dealing with those pests.

Man has used a variety of pest control measures for centuries to protect his crops, but the most significant move came in the late 1940s.

Chemicals like DDT, 2,4-D, BHC and a number of others became the forerunners of the revolutionary new class of synthetic organic pesticides. In some cases the chemical weapons of war were turned into vital components in the struggle to increase food production.

But the expected victory over pests, and particularly insect pests, has not come.

About one-third of North American food production is now being lost before it is harvested despite the massive use of chemicals, the Office of Technology Assessment for the U.S. Congress said in a report published last year. It said another 10 per cent is lost after harvest. The losses in tropical climates are even higher, the report said.

"The amount of land now cultivated is 50 per cent greater than would be required if there were no pest-induced losses," it said.

Crop losses to insects, disease, and weeds increased 1.5 per cent between 1950 and 1975, U.S. Department of Agriculture statistics show.

Figures cited in a 1978 report by Dr. David Pimentel, a professor with the faculty of agriculture and life sciences at Cornell University, show a few successes.

Losses to weeds in the last 35 years dropped by 5.8 per cent.

"This is undoubtedly due to improved

herbicide, mechanical and cultural weed control practices," Pimentel said in his report.

"Over that same period, losses from plant pathogens increased only slightly, from 10.5 per cent to 12 per cent."

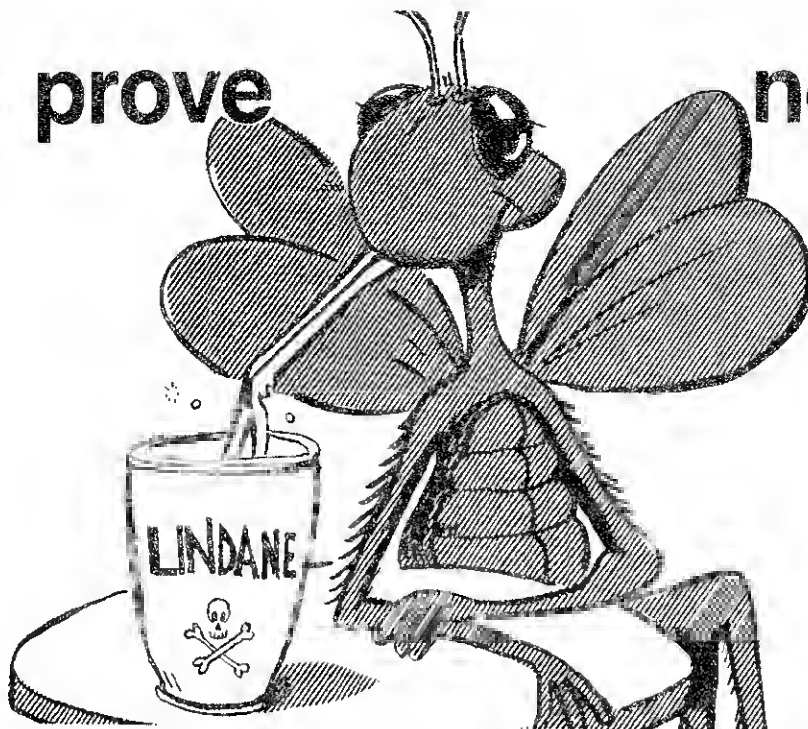
"Crop losses on the average due to insect pests, however, have increased nearly two-fold."

U.S. Department of Agriculture figures show that crop losses due to insects went from seven per cent in the 1940s to 13 per cent in 1978, despite a 10-fold increase in the use of insecticides.

"The substantial increase in crop losses due to insect damage despite increased pesticide use can be accounted for by some of the major changes that have taken place in agriculture since the 1940s," Pimentel said.

Among them are:

- Planting of some crop varieties that are highly susceptible to insect pests;
- Destruction of natural enemies of certain insect and plant pests;



• Reduced crop rotations and crop diversity, which allows a build-up of certain pests;

• Reduced sanitation in fields, including less attention to getting rid of plant residues and infected crop residues;

• Planting of crops in marginal areas where they are more susceptible to attacks from pests; and

• Use of pesticides that changes the biology of the plant slightly, making it more susceptible to pests.

One of the biggest problems has been the evolution of insects that are resistant to the toxic effects of the man-made poisons.

As early as 1946, some houseflies were immune to DDT. Recently, lice resistant to lindane have been reported in B.C.

One example of how resistance can develop over a very short time is tobacco budworm resistance to the insecticide Methyl Parathion. Data collected by scientists at Texas A & M University

showed that application at a rate half a pound per acre would kill 100 per cent of the tobacco budworm in 1967. By 1970 three pounds per acre would only kill 50 per cent of the budworms in a field.

American authorities estimate there are now about 400 species of insects resistant to pesticides. That is more than twice the number of resistant species just 15 years ago.

Resistance is developed through an evolutionary process.

The susceptible insects are killed by a poison, but there are a few insects that have the genes for resistance and survive. Those genes are passed on to a few of the next generation of insects. The continual spraying of the same pesticide will wipe out those insects which did not have the gene for resistance, but more and more insects with resistance survive until almost all are immune.

That immunity can spell disaster for farmers who depend solely on the chemicals that the pest is immune to. If the chemical no longer works and natural enemies of the pest have been eradicated by the chemicals, this leaves the pest species free to multiply dramatically.

In the early 1960s the development of resistance in certain species of insects saw the devastation of cotton crops in the southern U.S. and drove many farmers into bankruptcy.

The Office of Technology Assessment said in its report that this resistance to insecticides, plus other factors that restrict or stop the use of alternative chemicals, could have serious consequences.

It said that for short periods in the last few years some types of crops in the U.S. were completely without any type of protection from insect pests.

Chemical warfare against bugs is big business

The use of chemicals to battle the multitude of pests that attack food crops has increased dramatically in North America since the 1940s.

Millions of pounds of pesticides are now spread on agricultural land and on crops throughout Canada each year. Several million more pounds are sprayed on forests, gardens, lawns and in homes. In the U.S. more than one billion pounds of pesticides are used each year.

The amount of pesticide used in North America has doubled in the past decade, a 1979 report from the U.S. Congress' Office of Technology Assessment notes. Since the introduction of the major synthetic organic pesticides in the 1940s, pesticide use has increased twelvefold.

It is a big business, with more than \$250 million in sales in Canada annually, according to the Canadian Agricultural Chemicals Association (CACA).

But exactly how many pounds of pesticides are used, and where they are used, is difficult to determine. The most recent comprehensive set of figures on pesticide sales was compiled in 1977 by Statistics Canada. No figures have been gathered since that time, because the federal agriculture department was no longer willing to sponsor the costs of collecting and compiling the data, an official with Statistics Canada told The Leader-Post.

Even those figures gathered by Statistics Canada have gaps because of the

regulations protecting information about sales by specific companies.

In the last three years the value of pesticides sold has climbed by about \$60 million, from \$191 million in 1977 to the \$250 million now estimated by CACA.

While representatives of the chemical industry argue that curtailing the sales of pesticides would have a severe impact on agricultural production, figures show the use of pesticides could be cut by at least 15 per cent without even touching agricultural uses.

Statistics Canada figures from 1977 show that home and garden and industrial users of pesticides make up about 15 per cent of total sales.

These uses accounted for sales of about:

- 1.6 million pounds of pesticides used as fumigants;
- 1.7 million pounds of insecticides used in the home and garden;
- 92,000 pounds of insecticides used on pets;
- 1.8 million pounds of herbicide used on lawns and gardens;
- 1.6 million individual no-pest type insecticide strips;
- 950,000 cans of spray insecticide, herbicide and fungicide; and
- 759,000 pounds of poison baits for insects and rodents. This does not include the 1.2 million pounds of poison used against rats and mice and classified under agricultural uses.

In all, these products accounted for

nearly \$30 million in sales in 1977.

But the big use was agriculture - with sales totalling \$162 million in that year.

All those pesticides were not used in the production of food, however. Included in the agricultural figures were sales of insecticides, herbicides and fungicides used in spraying forests, parks, playgrounds, golf courses and a number of other large, non-agricultural uses.

Saskatchewan is one of the heaviest users of pesticides in Canada, primarily herbicides for weed control in fields. It uses nearly as much herbicide as Alberta, Manitoba and British Columbia combined.

In 1979 more than 8.3 million pounds of herbicides were sold for agricultural use in Saskatchewan, according to survey conducted by the Manitoba agriculture department.

Nearly 65 per cent of that was 2,4-D and another 15 per cent was MCPA.

The other three western provinces combined used a total of just over 8.7 million pounds of herbicides, the survey found.

The Saskatchewan Association of Rural Municipalities, in the brief it presented to the provincial cabinet Oct. 22,

emphasized the economic importance of the chemical pesticide business in this province and in Canada generally.

"The chemical industry not only spends a great deal of money on chemicals, but also on capital construction of new plants and facilities. It is estimated that in the next three years over \$40 million will be spent on new facilities by the chemical companies," the brief said.

"This amount of construction is very important to the construction industry but it is also important to society in general because of the new jobs created and the spin-off effect."

In a defence of 2,4-D, the brief noted how important that one chemical was to individual retailers in this province.

"The farmer's net return would be seriously affected by the loss of 2,4-D and the agriculture supply industry, particularly the small rural retailer, would lose a big slice of his chemical sales."

"The retail chemical industry in Saskatchewan would lose about \$18 million annually. This is in sales of straight 2,4-D. It does not include 2,4-D sold in mixtures with other herbicides, nor does this figure include MCPA sales."



Methods of applying pesticides called inefficient, wasteful

Of the millions of pounds of pesticides used in Canada each year, much misses the target.

Dr. Raj Grover, a scientist with the federal agriculture department's research station in Regina, said wind drift of small droplets and vapors from spraying operations can be significant.

"The inefficiency of pesticide application technology is a concern," a report published in 1979 by the U.S. Congress' Office of Technology Assessment said.

"In some applications as little as 25 per cent of the toxicants reach the target. This inefficiency is not only wasteful but can cause secondary health and environmental problems outside the target area."

Spraying operations also can generate a number of serious problems.

In New Brunswick, public opposition developed to an aerial spraying program for spruce budworm when a number of children died from Reye's syndrome. Laboratory tests showed that one of the components of the spray mixture reduced the ability of the body to fight viruses that normally caused only minor illnesses.

Aerial spraying of the herbicide picloram (trade named Tordon 22K) in the area around Penticton, B.C. in 1979 caused damage to between 80 and 100 properties. In California one pilot accidentally hit a municipal water treatment plant with part of his load of pesticides.

Throughout North America hundreds of thousands of bee colonies are lost each year to careless insecticide use. The costs of lost honey production are substantial. But just as important is the loss of bees that pollinate fruit, vegetables and other crops - a vital part of the biological process that produces much of the food we eat.

As well, the drift of herbicide vapors

and droplets can damage sensitive crops some distance away, causing significant financial losses.

In the U.S., where about two-thirds of all pesticides are applied by aircraft, studies have shown that the turbulence caused by an airplane's passage through the air can propel spray droplets high into the air, where they can drift for miles.

Evaporation of the chemicals that do hit the target area can also carry the poisonous vapors far beyond the area they were applied.

Studies done in California by Grover and other agricultural scientists showed significant migration of the herbicide EPTC when it was put into irrigation water for application to alfalfa crops. About seven per cent was lost through the runoff of irrigation water.

But nearly 75 per cent of the chemical vaporized and entered the air during the

four-day observation period.

A study done in Saskatchewan in 1972 showed that 2,4-D was in the air in this province in substantial amounts during the spraying season, with particularly high levels showing up at the monitoring station in Saskatoon.

That study noted that droplet and vapor drift after boom spraying of fields could mean as much as 30 per cent of the 2,4-D applied would miss the target.

With pesticides sales in Saskatchewan approaching 10 million pounds a year, worth roughly \$18 million, even a relatively small percentage of drift could mean a couple of million pounds of chemicals are not being applied where they are intended.

Work is now under way at research facilities throughout North America and Europe in an effort to develop more efficient spraying equipment and methods.

Dr. Jim Hay, director of the agricul-

tural research station in Regina, said the development of better sprayers and methods could cut the use of herbicides in this province by between 25 and 50 per cent.

While inefficient spraying equipment is a problem, some farmers are making matters worse.

A study conducted by agricultural engineers from the University of Nebraska in 1979 found that pesticide application as practised by many farmers was a hit-and-miss operation.

The study, as reported in the publication *Successful Farming*, found that two-thirds of all pesticide applicators were making serious application errors.

The mistakes, which included inaccurate measuring and mixing of pesticides, worn equipment and failure to read labels, were causing both over- and under-application of pesticides. Those mistakes were adding between \$2 and \$12 per acre to the cost of pest control, the study found.

Over-application of pesticides hurts through the extra cost of chemicals, the study said, but can also cause crop damage or weaken the plants so they are unable to withstand insects or poor growing conditions, thereby reducing the farmers' income.

Under-application is also costly. It can result in poor pest control that quickly cuts into yields, the engineers found.

The report also raised some questions about whether farmers generally would take advantage of the new spraying equipment being developed. It noted that if many farmers are reluctant to spend a few dollars on a new set of nozzles for their equipment, they will not likely put out \$500 to \$1,000 or more for new spray monitoring and control equipment.



Chemical industry's figures questioned

Industry spokesmen, in agricultural publications, news releases and briefs to government, warn of disaster if the use of pesticides is severely curtailed.

But many people dispute those grim predictions.

They argue that crop losses resulting from a total ban on the use of pesticides would be much less than industry predictions.

And a report released by the U.S. Congress' Office of Technology Assessment late in 1979 said pesticide use could be cut by up to 75 per cent and yields could actually be increased through the use of what it calls integrated pest management (IPM) programs.

But representatives of the Canadian Agricultural Chemicals Association (CACA) predict added crop losses of between 30 and 50 per cent without the use of chemical pesticides.

"If we couldn't use them in agriculture, weed, insect and fungus pests would drastically reduce the yield from all food crops - in some cases by so much there would be no point in growing them," the CACA said in a position paper released earlier this year.

"Some authorities predict the immediate first-year effect could be an overall reduction in yield of 50 per cent, and at least 30 per cent."

Don Saelhof, a representative for Monsanto and a member of CACA, told The Leader-Post that Saskatchewan farmers could expect horrendous losses if they stopped using herbicides.

Famine stalks the world, striking down the poor by the millions.

In Canada, agriculture and the national economy are devastated. Food production plummets as insect pests destroy crops and massive weed infestations choke fields.

That grim scenario has been used often in recent months by the agricultural chemical industry in its battle for the hearts and minds of the public.

"In general terms, weed infestations would take in excess of 50 per cent of yields in Saskatchewan."

He said the losses would come two to three years after the suspension of herbicide use, rather than in the first year.

"Farmers in the 1930s and 1940s were absolutely ruined in many cases because of their inability to control the weeds," Saelhof said.

But he hedged on the figures a bit, saying that the 50 per cent drop in yields was based on the premise that no alternatives to chemical herbicides would be used.

The Saskatchewan Association of Rural Municipalities, in its annual brief to the provincial cabinet on Oct. 22, used similar figures.

"It is estimated that if the phenoxy herbicides, of which 2,4-D is the main one, were taken off the market, food production would drop 25 per cent to 30

per cent in the first year and would drop to 50 per cent within five years," the association said.

It said the value of wheat lost would be about \$300 million annually in Saskatchewan alone. The losses to the provincial economy would be even greater if increased cultivation costs, higher dockage because of weed seeds in the grain, and lower quality grain were added on, it said.

A.D. St. Clair, president of the CACA, during a recent trip to Saskatchewan also cited losses of 30 to 50 per cent in production if pesticide use was severely curtailed. But when challenged on that estimate by a caller to a Regina radio openline program, St. Clair admitted that he was not aware of any scientific studies that would back up those figures.

Dr. David Pimentel, a professor of agriculture and life sciences at Cornell

University in Ithaca, N.Y., estimates losses would be much less than that if other pest control measures were instituted.

He said that in a recent study the withdrawal of all pesticides and increased application of non-chemical pest control measures already in use would mean added losses of about nine per cent.

Pimentel was critical of the methods used in the U.S. to determine crop losses due to various pests.

Design criticized

He said the information is based on experimental field tests where treated and untreated plots were compared in a manner that would emphasize the benefits of pesticide use. Those test plots are usually deliberately established in areas where infestations of pests are severe and losses will be high, he said.

U.S. agricultural production in general would suffer slightly higher losses to pests - up by about five per cent because of insects, three per cent because of fungus and other plant pathogens, and about one per cent due to weeds, Pimentel said.

He said the amount of food energy, in terms of calories lost, would be about five per cent.

But the effect of not using pesticides would strike unevenly, he notes.

"Although the supply of food in the nation would be ample, the quantities of

certain fruits and vegetables, such as apples, peaches, plums, onions, tomatoes, peanuts and certain other crops would be significantly reduced," Pimentel said.

In Saskatchewan, a ban on the use of all pesticides would certainly have an economic affect on agricultural production.

But the losses would not be as great as those forecast by the CACA, Dr. Jim Hay, director of the federal agriculture research station at Regina, told The Leader-Post.

Hay said crop losses of between 30 and 50 per cent would not happen in the grain-growing areas of Western Canada.

15% loss here

"Our figures are a 15 per cent loss due to weeds," Hay said.

"Now that is going to vary from field to field. Some will be a complete loss and others will have no loss at all. Where we have done tests that cover a wide number of fields and a wide number of weeds, this is the figure we keep coming up with."

Hay said weeds are the major problem in Saskatchewan and insects and plant pathogens, such as fungus, rusts, and bacteria, would take only a small amount of the crop.

He said that in certain years armyworm and grasshopper infestations could take up to 100 per cent of the crop in certain areas, but losses averaged over a decade would not likely exceed the 15 per cent figure. "I don't think that (estimates of 30 to 50 per cent losses) would apply in the West."

In the current debate over chemical pesticide use, the middle ground seems to have been forgotten. The arguments have been polarized by those who seem intent on making the issue a debate over whether chemical pesticides should be banned completely or whether use should continue with the current practices and levels of application.

But the Office of Technology Assess-

ment, which advises the U.S. Congress on a variety of technological issues, released a report in late 1979 which shows there is a middle road.

That report, entitled Pest Management Strategies in Crop Protection, said the use of pesticides can be cut by 75 per cent, crop yields can be increased about

15 per cent, and production costs held steady through the use of intergrated pest management programs.

"This approach offers the promise of more stable crop protection and production with the least hazard to man and the environment," the report said.

It said that through the co-ordinated

use of a variety of pest control measures, the use of chemical pesticides would be reduced to the absolute minimum level needed to allow food production to continue at its present level.

But to develop IPM programs will require a major commitment of time, people and money by government, the report said.

It said the evolution to IPM will not take place in a significant way without government involvement. With a major government effort, however, IPM could develop rapidly and be in use throughout the U.S. within 15 years, it said.

While the recommendations of the report are directed at the American government, they could also apply to the Canadian federal and provincial governments.

Among the recommendations are:

- Providing increased support for research into pest and crop biology, crop production, and pest control methods;

- Providing federal support for co-ordinated pest and weather monitoring programs, public information programs, and improve support of plant health clinics so problems are discovered early;

- Providing support for more education, extension, and practical demonstrations of IPM methods;

- Increasing support for biological control and biological resistance development programs; and

- Establishing a clear federal policy and assign the federal agriculture department the responsibility, authority, and necessary financing to co-ordinate IPM research and to implement information programs.

"A major effort over the next few years to remove the obstacles to the implementation of IPM would enable much of the potential of the program to be realized within 15 years," the report said.

"Under IPM, agriculture would achieve an increase in production, while at the same time providing maximum protection to man, his crops and the environment."



Bugs encouraged to wage war on bugs

A revolutionary new system of pest control known as integrated pest management (IPM) promises to bring major changes to agricultural production.

Massive use of chemical pesticides could become a thing of the past. Instead of spraying everything in a field, farmers would spray only major infestations of pests. The weapons in the farmers' chemical arsenal would be more selective than the broad-spectrum pesticides now in use.

North American food production could be increased by 15 per cent or more over present yields as a result of a better balance between pests and their natural enemies, a report of the U.S. Congress' Office of Technology Assessment (OTA) said.

The report, published in late 1979 by the Office of Technology Assessment, said IPM appears to be the most promising crop protection strategy for the future.

"IPM programs for major U.S. crops can reduce pesticide use up to 75 per cent, reduce pre-harvest pest-caused losses by 50 per cent, and reduce total pest control costs by a significant amount," the report said.

While the U.S. now appears ready to put a major emphasis on IPM, it appears to have received one of its first practical tests in Canada.

In a speech to a 1977 conference at Fort Qu'Appelle on alternatives to chemical pesticides, W.J. Turnock, a researcher with the federal agriculture department, told about the use of the system in eastern Canada for more than two decades.

Turnock said an integrated pest con-



trol program, occasionally slightly refined and improved over the years, has been used by apple growers in Nova Scotia and Eastern Quebec since the 1950s. He said the program resulted in reduction in pest damage to the apple crop and a reduction in the use of pesticides.

The integrated pest management program, as its name implies, uses a variety of pest control techniques to protect food crops.

"Its goal is to develop methods of managing the crop for the maximum

production at minimum cost and the minimum environmental contamination," Turnock said.

"In contrast, the approach of most pest control research has been to identify promising avenues of control and then to direct resources into the program as if each one was to be the total solution to the pest problem. If a control method failed to meet these rigorous standards for success, research was channelled into developing another technique, chemical or method of application."

Turnock said this approach lacked the flexibility needed in coping with variations in local geography, weather, field conditions, farming practices, and pests.

"The integrated pest management approach has developed because there have been too many failures of the single-factor programs."

There are six steps in an IPM program. These steps, as outlined by the Office of Technology Assessment (OTA) in its 1979 report, are:

1. Identify the pests to be controlled.

"An organism should not be classed as a pest until it is proven to be so," the report said. The positive identification of pest insects is very important, Turnock said. "Information on the need to control flea beetles led one Manitoba farmer to spray a fallow field infested with small black beetles. Unfortunately, these were carabid beetles - beneficial predators on other insects," he said. He added a similar thing happened in northern Alberta.

2. Define a specific area to which IPM measures will be applied.

Because the system must be tailored to specific conditions too large an area might make the IPM program unnecessarily complicated. "The limits of the area should be determined by the characteristics of the local cropping system and the movement of the key pests," the OTA said.

3. Development of the pest management strategy.

"The fundamental strategy of pest

management is the coordinated use of multiple control practices in a single system. The goal is to hold pest numbers and crop damage to tolerable levels. It is generally a containment strategy rather than an eradication strategy."

4. Establish economic injury limits.

"The economic injury threshold is the pest population level that causes a loss to the crop greater than the cost of pest control measures," the OTA report said. It noted that this threshold will vary greatly from crop to crop, with weather conditions, and other local factors.

Turnock noted that unnecessary pesticide use is at times a problem. "It may be attributed to the insurance philosophy, that pesticides are cheap and its easier to treat the crop than to evaluate the need for a treatment. And it could be the tidy bug-hater philosophy, that a good farmer just doesn't allow pests in his fields. Both attitudes may be fostered by those with vested interests in pesticide application. For example, some low and non-damaging infestations of moths were recently sprayed, reportedly on the advice of operators of the spray planes," he said.

Some work on economic thresholds has been done by the agriculture research station in Regina. Dr. Jim Hay, director of the federal agriculture department's research station, said charts outlining the number of wild oat plants per square foot can be used by farmers to determine what kind of yield reductions they can expect in a field. Once the yield reductions are calculated, the farmer can figure out whether he will gain anything by spraying. Hay said.

5. Develop reliable monitoring techniques.

"Monitoring information on some pests provides the basis for decisions on immediate suppressive pest management moves, while for other pests such information is useful only for management decisions concerning future cropping seasons. This monitoring involves

the measurement of pest populations, such as the numbers of spores, insects, seeds or eggs," the OTA report said. Monitoring of insects and weather conditions is already an important technique in Saskatchewan and has been used to predict serious infestations of armyworms and grasshoppers. Turnock said that effective monitoring and prediction reduces pesticide use by alerting producers to pay special attention at specific locations and dates. It also allows for more effective timing of pesticide applications, catching the pests when they are most vulnerable.

6. Develop mathematical models so that problems can be predicted and described.

"Modeling is a very useful tool in organizing research, in identifying knowledge gaps that must be filled to understand the system, and in predicting over time the behavior of the crop production system and its pests," the OTA report said.

While these six steps should be used in establishing an integrated pest management program, they are not essential the OTA said.

"Integrated control tactics for individual or groups of similar pests can be implemented without waiting for the 'perfect' total program to be developed. These tactics can be modified, improved and integrated with control tactics for other pests as new information becomes available."

The OTA was generous in its praise of IPM.

"This approach offers the promise of more stable crop protection and production with the least hazard to man and the environment."

But it said government support is essential if there is to be a shift away from the current practices used in pest control. With major support by government, IPM would develop rapidly and be used extensively by farmers within 15 years, it said.

Average person said carrying dangerous chemicals

The average person is carrying a "very large load of cancer-causing chemicals" a conference on drugs and chemicals in food production was told.

Dr. Lester Crawford, a former official of the U.S. Food and Drug Administration and a veterinarian and professor of pharmacology at Georgia University, said more than 90 per cent of North Americans have a variety of chemicals in their bodies, including PCBs, DDT, and a number of other chlorinated hydrocarbons.

"To think those chemicals don't cause cancers in a significant number of people is rather far-fetched," Crawford said.

"He said we are exposed to about 10,000 cancer-causing chemicals used in pesticides, industrial chemicals, the food we eat and from a number of other sources.

"We know that carcinogenic agents work together. To say that is not so is simply irresponsible."

Crawford was critical of those who say there is a level below which exposure to a cancer-causing chemical is harmless. He said as little as one molecule of a cancer-causing chemical can trigger cell changes that could lead to cancer.

Questions about the health hazards of

dioxins — a group of about 75 closely related chemicals — have been raised in recent years because of problems with the dioxin TCDD contaminating the herbicide 2,4,5-T and the announcement about two weeks ago that 2,4-D also contains a variety of dioxins. TCDD is the most lethal chemical ever produced by man and can kill at concentrations of about 500 parts per trillion (equal to less than half a cup mixed into 10 million gallons of water). Other members of the dioxin family are less toxic but exactly how much less and how the various types of dioxins react when in combination is not yet known. Dr. David Penman, senior health consultant with the Saskatchewan environment department, said.

The recent actions of an American company in dealing with the issue of health hazards from dioxins raised Crawford's ire.

"I was appalled with a large advertising campaign that said since dioxins have been around for centuries, ever since man started to make fires, that people should not worry about it. Here we have one of the most toxic chemicals known to man and we are being conditioned to accept it.

The attitude seems to be that if everything causes cancer, then nothing causes cancer."

Regina group works

Biological control of pests is being touted as the alternative to chemical pesticides.

It is seen by many as the non-polluting, non-poisonous answer to the problems that face a world needing more and more food. But there are problems to overcome and much more research is needed before a major dent can be made in the use of chemical pesticides.

Most of the research work being done in Canada into biological control of weeds is done at the federal agriculture research station in Regina.

Dr. Jim Hay, director of the station, said the scientists in the Regina research group are doing virtually all the work on that subject in Canada.

There have been a number of successes. Insect controls for nodding thistle, ragwort and St. John's wort have been developed here.

Attention is now focussed on weeds such as the diffuse knapweed, which is a major problem on pasture lands in certain parts of B.C. and could establish itself as a serious problem on the Prairies. Other weeds like the Canada thistle and leafy spurge, both problem weeds on the Prairies, also are the focus of attention.

"A lot of weeds we have here came from Europe or Asia. They got here without their natural predators. We are interested in re-establishing the predators that got left behind," Hay said.

"But we can only bring in the ones that are absolutely specific to the weeds. The whole crux of this is that the insects must feed only on one specific weed."

He said that narrows the range of potential insect candidates down to a very few and the weeds that would be suit-

able for insect control methods are limited. The Regina station is looking at only about a half dozen weeds that could be controlled in this manner.

"We are not going to be able to find insects to control all weeds. Anything we bring in to control, say wild oats, well the chances are it will eat oats as well and there's no way we want that."

"But that does not mean that insects will not pay off. If we can find one for, say leafy spurge or Canada thistle, this would be a tremendous boon to farmers," Hay said.

"We don't have all that many weeds. Right now there are about 20 weeds that are of major economic importance, and if we can take even three or four off the list by biological controls, that would be a big step forward."

But biological pest control methods do have problems.

One of the biggest is getting the insects to survive under field conditions.

Hay said temperature, humidity and a number of other environmental factors can kill what might otherwise be an ideal control species.

As well, biological methods take longer than chemical herbicides in controlling weeds. Hay said it takes from four to six years to build up a population of insects to a level that will effectively control weeds. It is definitely a slower process than the use of herbicides, he said.

"But then the beauty of it is that there are no recurring costs."

He said the insects tend to perpetuate themselves and keep the weeds down.

on biological controls

"It doesn't eliminate the weed. The weed is just suppressed."

But this suppression of weeds can be enough to reduce their economic effects to almost nothing, Hay said.

The area that seems to hold the most potential is plant pathogens - fungus, rusts, and bacteria that attack them.

Hay said the Regina station will be starting a program to identify and test plant pathogens that could be put to use in protecting Canadian food production.

He noted that while it will be a new area for station scientists, results of work in the United States and Australia have been encouraging.

"Using pathogens has a big potential. You can take two approaches (in control methods). You can bring the pathogen in and release the spores and let it go. Or you can take the spores from the pathogens and spray it on like you would a chemical herbicide."

The work being done on biological control methods is almost entirely being handled by government or university facilities.

"The profits aren't there for private industry to be interested in it," Hay said.

But he did note that some companies have shown an interest in the use of pathogens because there is an opportunity for profits.

While millions of dollars are spent annually on the development of chemical pesticides, the figure is much less for biological controls.

Hay said he estimates federal government spending on biological weed con-

trol at about \$500,000 this year.

Federal grants to Uniroyal for the development of one pesticide, a combination insecticide - fungicide known as Vitavax, totalled nearly \$1 million.

But federal spending on biological controls could pick up as pressure against the use of chemical pesticides increases.

"There's no doubt about it. We've been asking for money for a long time. Pressure from outside certainly does help us to get support for this sort of research," Hay said.

The biological approach to insect control also involves the use of pathogens and of predatory insects that will clean the pests out of a field.

As well, work is now under way in the U.S. to control the reproduction of insect pests. Specially sterilized male insects are released in heavily infested areas. They mate with normal females, but the eggs produced will not hatch.

Research into sexual attractants is also being carried out. The idea behind these attractants is that they will be manufactured in large quantities and sprayed over a wide area, confusing the insects normal breeding instincts and totally disrupting their reproduction.

An alternative method for the use of these attractants is to lure the insects into traps where they will be killed.

Both the use of sterilized insects and sexual attractants have the advantage of being specific to only one species of insect.

Suspected chemicals listed

Acephate (Orthene), alachlor (Lasso), allidochlor (Randox), ametryn (Evik), atrazine (Atrazine), *Bacillus thuringiensis* (Dipel, Thuricide), barban (Carbyne), bifenox (Modown), binapacryl (Morocide).

Bufencarb (Bux), captafol (Difolatan), captan (Captan), carbathiin (Vitavax), carbofuran (Furadan), chlorbromuron (Maloran), chlorothalonil (Bravo), chlorpropham (CIPC), chlorpyrifos (Lorsban), chlorthal dimethyl (Dacthal), crotoxyphos (Ciodrin), cyanazine (Bladex).

Cyprazine (Outfox), daminozide (Alar), desmedipham (Betanex), dialifos (Torak), diallate (Avadex), diazinon (Basudin), dichlobenil (Casoran), dichlorvos (Vapona).

Diethatyl (Antor), dinitramine (Cobex), dinoseb (DNBP), dioxathion (Delnav), diquat (Reglone), disulfoton (Di-Syston), edifenphos (Hinosan), endosulfan (Thiodan), endothall (Des-I-Cate), ethiolate (Prefox), ethion (Nialate).

Etridiazole (Terrazole), fenamiphos (Nemacur), fenbutatin oxide (Vendex), fenitrothion (Sumithion, Folithion), fensulfothion (Dasanit), fentin

More than 100 individual chemicals are suspect because of testing Industrial Biotech Laboratories carried out. In June, 1980 the federal government listed 97 of those chemicals and several weeks later added nine more to the list.

These individual chemicals are contained in several thousand different brand named products sold in Canada. The chemical Pyrethrins, for example, is in 500 different products, according to the 1979 edition of the federal Compendium of Pest Control Products.

Listed here are the names of the chemicals suspect because of the IBT affair, as listed in a federal health department news release published in July, 1980.

The common name is listed first and trade names of the compounds are in brackets.

hydroxide (Du-Ter), fenvalerate (Pydrin, Balmark), fesamine (Krenite), folpet (Phaltan), formetanate hydrochloride (Carzol).

Glyphosate (Roundup), glyphosine, hexazinone (Velpar), mefluidide (Embark), methamidophos (Monitor), methfuroxam (Trivax), methiocarb (Mesurol), methomyl (Lan-

nate), methoprene (Altosid), metiram (Polyram), metobromuron (Dual), metribuzin (Sensor).

Monocrotophos (Azodrin), naled (Dibrom), naptalam inoseb (Dyanap), nicotine sulphate (Nicotine), noruron (Norea), oxamyl (Vydate), oxydemeton-methyl (Metasystox-R), paraquat (Gramoxone),

parathion (Pencap E), pendimethalin (Prowl), pentachlorophenol, phenothrin (Sumithrin).

phosphamidon (Dimecron) Pictoram (Tordon), profenofos (Selecron), profluralin (Pregard, Tolben), prometon (Pramitol), propachlor (Ramrod), propargite (Omite), propanil (IPC), propoxur (Baygon), pyrethrins (Pyrethrins), Santophen, simazine (Gesatop, Primate).

Sulfallate (Vegadex), TCMTB (Busan), terbufos (Counter), terbuthylazine (Topoguard, Faneron), terbutryn (Prebane, Igran, Topoguard), tetrachlorvinphos (Gardona, Rabon), tetradifon (Tedion), thiofanox (Dacamox), toxaphene (Toxaphene), triallate (Avadex BW), triclosan (Irgasan).

A number of chemicals tested by IBT and included on an earlier list were free of concern the federal government said in July. These chemicals are naptalam (Alanap), bromofenoxim (Faneron), difenzoquat (Avenge), Harvade, methidathion (Supracide), methylparathion (Pencap M), permethrin (Ambush), and phenmedipham (Betanal).

The use and safety of chemical pesticides promises to be one of the major environmental issues of the 1980s.

Increasing food production to feed more people on this planet will increase the pressure on farmers to use more and more chemicals. At the same time, pressure from scientists, environmentalists, and consumers could mean government action to restrict the use of many chemicals that are now on the market.

This series of stories started in June, 1980 when rumors that the Saskatchewan government was planning to ban a number of chemicals reached The Leader-Post. While the rumors were wrong, they prompted The Leader-Post to assign reporter Peter von Stackelberg to do some research into the testing of pesticides and the problems government was facing because of the Industrial Biotech Laboratories (IBT) affair.

Since June The Leader-Post has published more than 50 stories about the use and safety of chemical pesticides. Many of the major stories from among those 50 are reprinted in this booklet.

— Peter von Stackelberg joined The Leader-Post as a reporter in October, 1979. Prior to working on the agriculture beat and chemical pesticide stories he covered the Saskatchewan Legislature.

Before joining The Leader-Post, he worked as a reporter with The Daily Herald Tribune in Grande Prairie, Alta. During the four years he was there, von Stackelberg covered agriculture, environmental issues in forestry, the city hall beat and a number of other areas.

He is a graduate of the journalism program at Ryerson Polytechnical Institute in Toronto.



He was born on Oct. 28, 1953 in Elk Point, Alta. (because it had the closest hospital to the farm near Maidstone, Sask. where his parents lived). His family settled in Peace River, Alta. in the late 1950s. He grew up in Peace River and in the late 1970s helped clear and work homestead land just north of Peace River.